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FINAL TECHNICAL REPORT

Planetary Geology and Geophysics Program

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Raymond E. Arvidson, Principal Investigator

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FINAL REPORT

The brief report is the final summary of activities conducted at Washington University under NASA Grant NSG-7087 from the Planetary Geology and Geophysics Program.

Grant NSG-7087 has been our mainstay for research in planetary geology over a number of years. The primary output of the efforts has been in the form of peer-reviewed publications, which are summarized in the following section. In brief, we have pursued analysis of Viking data of Mars and various data sets covering Venus. Our interest has been in weathering, erosion, and deposition, focused on atmosphere-surface interactions. The Grant has also supported our Regional Planetary Image Facility and development of computational and data management software to support all of the RPIFs. Detailed results are found in the articles referenced in the next section.

PUBLICATIONS LIST

1. Arvidson, R.E., M. Coradini, A. Carusi, A. Coradini, M. Fulchignoni, C. Federico, R. Funiciello, and M. Salomone, 1976. Latitudinal variation of wind erosion of crater ejecta deposits on Mars. *Icarus*, v. 27, p. 503-516.
2. Arvidson, R.E., 1977, The exploration of Mars, *Washington University Magazine*, Winter, p. 18-23.
3. Guinness, E.A. and R.E. Arvidson, 1977. On the constancy of the lunar cratering flux over the past 3.3 billion yrs., *Proc. Lunar Planet. Sci. Conf. VIII*, p. 3475-3494.
4. Oberbeck, V., W. Quaide, R.E. Arvidson, H. Aggarwal, 1977, Comparative studies of Lunar, Martian, and Mercurian craters and plains, *J. Geophys. Res.*, v. 82, p. 1681-1698.
5. Arvidson, R.E., K.L. Jones, A.B. Binder, 1978, The surface of Mars, *Scientific American*, v. 283, p. 76-89.
6. Arvidson, R.E., E.A. Guinness, S. Lee, 1979, Differential aeolian redistribution rates on Mars, *Nature*, 278, p. 533-535.
7. Arvidson, R.E. and M. Lange, 1979, *La Geologie de Mars*, *LeRecherche*, p. 854-863.
8. Guinness, E.A., R.E. Arvidson, D.C. Gehret, L. Bolef, 1979. Color changes at the Viking Landing sites over the course of a Mars year. *J. Geophys. Res.*, v. 84, p. 8355-8364.
9. Hargraves, R.B., D.W. Collinson, R.E. Arvidson, and C.R. Spitzer, 1979, The Viking magnetic properties experiment: Extended mission results. *J. Geophys. Res.*, v. 84, p. 8379-8384.
10. Jones, K.L., R.E. Arvidson, E.A. Guinness, S.L. Bragg, S.D. Wall, C.E. Carlston, D.G. Pidek, 1979, One Mars Year: Viking Landing Imaging Observations of Sediment Transport and H₂O Condensates, *Science*, v. 204, p. 799-806.
11. Arvidson, R.E., 1980, Martian data, Mainly Viking, *Geotimes*, v. 25, p. 20-22.
12. Arvidson, R.E., 1980, Review of Gornitz, *Geology of the planet Mars*, *Icarus*, v. 44, p. 816.
13. Arvidson, R.E., L.K. Bolef, E.A. Guinness, P. Norberg, 1980, BIRP - software for interactive search and retrieval of image engineering data, *NASA Contractor Report 3299*, 71 p.
14. Arvidson, R.E., K.A. Goettel, and C.M. Hohenberg, 1980, A post-Viking view of Martian geologic evolution, *Reviews of Geophysics and Space Physics*, v. 18, p. 565-603.
15. Arvidson, R.E., 1981, Review of Murray et al., *Earth-like Planets*, *Science*, v. 213, p. 861-862.

16. Arvidson, R.E. and E.A. Guinness, 1981, Global topography of Earth, Venus, Mars: Clues to tectonic styles, *J. Geological Education*, v. 30, p. 86-92.
17. Arvidson, R.E., C.M. Hohenberg, J.R. Shirck, 1981, Long-term characterization of the Martian atmosphere and soil from cosmic ray effects in returned samples, *Icarus*, v. 45, p. 250-262.
18. Arvidson, R.E. and G.F. Davies, 1981, Effects of lateral resolution on the identification of volcanotectonic features on Earth and Venus, *Geophys. Res. Lett.*, v. 8, p. 741-744.
19. Davies, G.F. and R.E. Arvidson, 1981, Possible relations between the early Martian geologic record, convective overturn, and core segregation, *Icarus*, v. 45, p. 339-346.
20. Arvidson, R.E., 1982, Proceedings of the Third International Colloquium on Mars: Dedicated to Thomas A. Mutch, 1931-1980, *J. Geophysical Research*, v. 87, p. 9716.
21. Arvidson, R.E., E.A. Guinness, A.P. Zent, 1982, Classification of Martian surface units based on Viking Orbiter color, albedo, and thermal data, *J. Geophys. Res.*, v. 87, p. 10149-10157.
22. Guinness, E.A., C. Leff, R.E. Arvidson, 1982, Changes at the Viking landing sites over the course of two Martian years, *J. Geophys. Res.*, v. 87, p. 10051-10058.
23. Bolef, L.A., E.A. Guinness, R.E. Arvidson, 1982, BIRP - A system for inter active search and display of image data, *Proceedings, IEEE Symposium on Remote Sensing and Geoscience*, v. GE-20, p. 378-383.
24. Arvidson, R.E., E.A. Guinness, H.J. Moore, J. Tillman, S.D. Wall, 1983, Three Mars Years: Mutch Memorial Station (Viking Lander 1) Imaging, *Science*, v. 222, p. 463-468.
25. Arvidson, R.E., E. Levinthal, R.S. Saunders, P. Schultz, 1983, Remote sensing of moons and planets, chapter 36 in Manual of Remote Sensing, 2nd Edition, American Soc. Photogrammetry, p. 2385-2415.
26. McGill, G.E., J.L. Warner, M.C. Malin, R.E. Arvidson, E. Eliason, S. Nozette, R.D. Reasenberg, 1983, Topography, surface properties, and tectonic evolution, Chapter 6 in Venus, D.M. Hunten, editors, Univ. Ariz. Press, p. 69-130.
27. Kieffer, H.H., R.E. Arvidson, and many others, 1984, Planetary Data Workshop, NASA Conference Pub. 2343, parts 1.2, 124 p.
28. Arvidson, R.E., 1985, From space exploration to utilization of the space perspective, environment, and materials, *Journal of Neurosurgery*, v. 63, p. 317-320.
29. Arvidson, R.E., 1986, Review of Photometry and Polarization, W.G. Egan, Elsevier, EOS, p. 122.
30. Kahn, R., E.A. Guinness, R.E. Arvidson, 1986, Loss of fine-scale surface texture in Viking Orbiter images due to atmospheric obscuration and a reassessment of latitudinal debris mantling on Mars, *Icarus*, v. 66, p. 22-38.

31. Soderblom, L., S. Solomon, R. Arvidson, 1986. A New Outlook for the AGU Planetology Section, *Eos*, p. 1193 (written by Arvidson as Secretary, AGU Planetology Section).
32. Arvidson, R.E., E. Guinness, S. Slavney, T. Stein, B. Weiss, 1987. Regional Planetary Image Facility Image Retrieval and Processing System. Users Guide, NASA Planetary Data System Document. 54 p.
33. Arvidson, R.E., V.R. Baker, 1987. Venusian Surficial Processes. V-GRAM: Magellan Quarterly Bulletin About Venus and the Radar Mapping Mission, October p. 4-10.
34. Guinness, E., R.E. Arvidson, M. Dale-Bannister, R.B. Singer, E.A. Bruckethal, 1987, On the spectral reflectance properties of materials exposed at the Viking landing sites, *J. Geophys. Res.*, v. 92, p. E575-E587.
35. Arvidson, R.E., 1988, Review of Universe, Second Edition, William J. Kaufmann, Academic Press, Inc., *Icarus*, 1988, 75, 571-572.
36. Presley, M.A. and R.E. Arvidson, 1988, Nature and origin of materials exposed in the Oxia Palus-Western Arabia-Sinus Meridiani Region, Mars, *Icarus*, 75, p. 499-517.
37. Arvidson, R.E., E.A. Guinness, M.A. Dale-Bannister, J. Adams, M. Smith, P.R. Christensen, R. Singer, 1989, Nature and distribution of surficial deposits in Chryse Planitia and vicinity, Mars, *J. Geophys. Res.*, 94, p. 1573-1587.
38. Arvidson, R.E., M. Schulte, R. Kwok, J. Curlander, C. Elachi, J.P. Ford, R.S. Saunders, 1988. Construction and analysis of simulated Venera and Magellan images of Venus, *Icarus*, 75, p. 163-181.
39. Plaut, J., R. Kahn, E. Guinness, R.E. Arvidson, 1988, Accumulation of sedimentary debris in the south polar region of Mars and implications for climate history, *Icarus*, 76, p. 357-377.
40. Plaut, J. and R.E. Arvidson, 1988, Comment on the spatial distribution of impact craters on Venus, *J. Geophys. Res.*, 93, p. 15339-15340.
41. Gooding, J.L., R.E. Arvidson, M. Yu. Zolotov, Physical and chemical weathering, chapter in Mars, *Proceed. Fourth Int. Colloq. on Mars*, in press.
42. Arvidson, R.E., J.L. Gooding, H. Moore, 1989, The martian surface as imaged, sampled, and analyzed by the Viking Landers, *Rev. Geophys.*, 27, p. 39-60.
43. Arvidson, R.E., 1990, Planetary Geology, feature article, *Encyclopedia of Physical Sciences and Technology*, Academic Press, p. 78-98.
44. Arvidson, R.E., J. Plaut, R.F. Jurgens, R.S. Saunders, M.A. Slade, 1990, Geology of southern Guinevere Planitia, Venus, based on analyses of Goldstone radar data, *Proceed. XX Lunar and Planet. Sci. Conf.*, p. 557-572.
45. Arvidson, R.E., R.E. Grimm, R.J. Phillips, G.G. Schaber, E.M. Shoemaker, 1990, On the nature and rate of resurfacing of Venus, *Geophys. Res. Lett.*, v. 17, 9, p. 1385-1388.

46. Arvidson, R.E., S. Slavney, The Planets--Major Members of the Solar System, Chapter in Compton's Encyclopedia. 1990 edition.
47. Greeley, R. and R.E. Arvidson. 1990. Aeolian processes on Venus: Earth, Moon, Planets, 50/51. p. 127-157.
48. Plaut, J.J., R.E. Arvidson, R. Jurgens. 1990. Radar characteristics of the equatorial plains of Venus from Goldstone observations: Implications for interpretation of Magellan data, Geophys. Res. Lett., v. 17. p. 1357-1360.
49. Arvidson, R.E. and others. 1991. Pre-Magellan Radar and Gravity Data Sets, 15 types of data, 650 megabytes, peer-reviewed, and published through NASA's Planetary Data System on CD-ROM.